

Science Standards of Learning Curriculum Framework 2010



Grade One

Board of Education
Commonwealth of Virginia

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by the

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The 2010 *Science Curriculum Framework* can be found in PDF and Microsoft Word file formats on the Virginia Department of Education's Web site at <http://www.doe.virginia.gov>.

Virginia Science Standards of Learning Curriculum Framework 2010

Introduction

The *Science Standards of Learning Curriculum Framework* amplifies the *Science Standards of Learning for Virginia Public Schools* and defines the content knowledge, skills, and understandings that are measured by the Standards of Learning tests. The Science Curriculum Framework provides additional guidance to school divisions and their teachers as they develop an instructional program appropriate for their students. It assists teachers as they plan their lessons by identifying essential understandings and defining the essential content knowledge, skills, and processes students need to master. This supplemental framework delineates in greater specificity the minimum content that all teachers should teach and all students should learn.

School divisions should use the *Science Curriculum Framework* as a resource for developing sound curricular and instructional programs. This framework should not limit the scope of instructional programs. Additional knowledge and skills that can enrich instruction and enhance students' understanding of the content identified in the Standards of Learning should be included as part of quality learning experiences.

The Curriculum Framework serves as a guide for Standards of Learning assessment development. Assessment items may not and should not be a verbatim reflection of the information presented in the Curriculum Framework. Students are expected to continue to apply knowledge and skills from Standards of Learning presented in previous grades as they build scientific expertise.

The Board of Education recognizes that school divisions will adopt a K–12 instructional sequence that best serves their students. The design of the Standards of Learning assessment program, however, requires that all Virginia school divisions prepare students to demonstrate achievement of the standards for elementary and middle school by the time they complete the grade levels tested. The high school end-of-course Standards of Learning tests, for which students may earn verified units of credit, are administered in a locally determined sequence.

Each topic in the *Science Standards of Learning Curriculum Framework* is developed around the Standards of Learning. The format of the Curriculum Framework facilitates teacher planning by identifying the key concepts, knowledge and skills that should be the focus of instruction for each standard. The Curriculum Framework is divided into two columns: Understanding the Standard (K-5); Essential Understandings (middle and high school); and Essential Knowledge, Skills, and Processes. The purpose of each column is explained below.

Understanding the Standard (K-5)

This section includes background information for the teacher. It contains content that may extend the teachers' knowledge of the standard beyond the current grade level. This section may also contain suggestions and resources that will help teachers plan instruction focusing on the standard.

Essential Understandings (middle and high school)

This section delineates the key concepts, ideas and scientific relationships that all students should grasp to demonstrate an understanding of the Standards of Learning.

Essential Knowledge, Skills and Processes (K-12)

Each standard is expanded in the Essential Knowledge, Skills, and Processes column. What each student should know and be able to do in each standard is outlined. This is not meant to be an exhaustive list nor a list that limits what is taught in the classroom. It is meant to be the key knowledge and skills that define the standard.

Grade One Science Strand

Scientific Investigation, Reasoning, and Logic

This strand represents a set of systematic inquiry skills that defines what a student will be able to do when conducting activities and investigations, and represents the student understanding of the nature of science. The various skill categories are described in the “Investigate and Understand” section of the Introduction to the *Science Standards of Learning*, and the skills in science standard 1.1 represent more specifically what a student should achieve during the course of instruction in the first grade. Across the grade levels, the skills in the first standards form a nearly continuous sequence of investigative skills and an understanding of the nature of science. It is important that the classroom teacher understands how the skills in standard 1.1 are a key part of this sequence (i.e., K.1, K.2, 1.1, 2.1, 3.1, 4.1, 5.1, and 6.1).

Standard 1.1

Strand: Scientific Investigation, Reasoning, and Logic

- 1.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- a) the senses are used to observe differences in physical properties;
 - b) observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy;
 - c) objects or events are classified and arranged according to characteristics or properties;
 - d) simple tools are used to enhance observations;
 - e) length, mass, volume, and temperature are measured using nonstandard units;
 - f) inferences are made and conclusions are drawn about familiar objects and events;
 - g) a question is developed from one or more observations;
 - h) predictions are made based on patterns of observations;
 - i) observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; and
 - j) simple investigations and experiments are conducted to answer questions.

Overview

Standard 1.1 is intended to define the “investigate” component of all other first-grade standards (1.2–1.8). The intent of standard 1.1 is that students will continue to develop a range of inquiry skills, achieve proficiency with those skills, and continue to develop an understanding of the nature of science in the context of the concepts developed in first grade. **Standard 1.1 does not require a discrete unit be taught on scientific investigation because the skills that make up the standard should be incorporated in all other first-grade standards.** It is also intended that by developing these skills, students will achieve greater understanding of scientific inquiry and the nature of science as well as more fully grasp the content-related SOL concepts.

Standard 1.1

Strand: Scientific Investigation, Reasoning, and Logic

<p>1.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ul style="list-style-type: none"> a) the senses are used to observe differences in physical properties; b) observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy; c) objects or events are classified and arranged according to characteristics or properties; d) simple tools are used to enhance observations; e) length, mass, volume, and temperature are measured using nonstandard units; f) inferences are made and conclusions are drawn about familiar objects and events; g) a question is developed from one or more observations; h) predictions are made based on patterns of observations; i) observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; and j) simple investigations and experiments are conducted to answer questions. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<ul style="list-style-type: none"> • The nature of science refers to the foundational concepts that govern the way scientists formulate explanations about the natural world. The nature of science includes the following concepts: <ul style="list-style-type: none"> a) the natural world is understandable; b) science is based on evidence, both observational and experimental; c) science is a blend of logic and innovation; d) scientific ideas are durable yet subject to change as new data are collected; e) science is a complex social endeavor; and f) scientists try to remain objective and engage in peer review to help avoid bias. <p>In grade one, an emphasis should be placed on concepts a, b, and e.</p> • Science assumes that the natural world is understandable. Scientific inquiry can provide explanations about nature. This expands students’ thinking from just a knowledge of facts to understanding how facts are relevant to everyday life. • Science demands evidence. Scientists develop their ideas based on evidence and they change their ideas when new evidence becomes 	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> • use their senses and simple tools, such as a magnifying glass and a balance to enhance their observations of physical properties. • make repeated observations of an object or event from multiple positions. • classify and arrange objects or events according to at least two attributes or properties so that similarities and differences become apparent. • measure length, mass, and volume, using nonstandard units. • use familiar events and objects to make inferences and draw conclusions. • develop a question from one or more observations. • predict outcomes based on actual observations and evidence rather than random guesses. • communicate observations and data with simple graphs and pictures,

Standard 1.1

Strand: Scientific Investigation, Reasoning, and Logic

<p>1.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ol style="list-style-type: none"> the senses are used to observe differences in physical properties; observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy; objects or events are classified and arranged according to characteristics or properties; simple tools are used to enhance observations; length, mass, volume, and temperature are measured using nonstandard units; inferences are made and conclusions are drawn about familiar objects and events; a question is developed from one or more observations; predictions are made based on patterns of observations; observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; and simple investigations and experiments are conducted to answer questions. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<p>available or the old evidence is viewed in a different way.</p> <ul style="list-style-type: none"> Science is a complex social endeavor. It is a complex social process for producing knowledge about the natural world. Scientific knowledge represents the current consensus as to what is the best explanation for phenomena in the natural world. This consensus does not arise automatically, since scientists with different backgrounds from all over the world may interpret the same data differently. To build a consensus, scientists communicate their findings to other scientists and attempt to replicate one another's findings. In order to model the work of professional scientists, it is essential for first-grade students to engage in frequent discussions with peers about their understanding of their investigations. To communicate an observation accurately, one must provide a clear description of exactly what is observed and nothing more. Observations should be made from multiple positions (e.g., observations of the same object from the front of the object, from the back of the object, looking down on the object, etc.) whenever possible to achieve a variety of perspectives. Observations should be repeated multiple times to assure accuracy. Once the characteristics of several objects or several events have been 	<p>oral and written statements, and with numbers.</p> <ul style="list-style-type: none"> answer questions by conducting simple experiments/investigations, using nonstandard measuring units and simple tools, such as a magnifying glass or a balance. A simple experiment is one that changes only one thing at a time (tests only one variable), gives quick results, and provides easily observable changes. record observations of movement (length/distance) using nonstandard units. compare the movement of objects, using graphs, pictures, and/or numbers.

Standard 1.1

Strand: Scientific Investigation, Reasoning, and Logic

<p>1.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ul style="list-style-type: none"> a) the senses are used to observe differences in physical properties; b) observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy; c) objects or events are classified and arranged according to characteristics or properties; d) simple tools are used to enhance observations; e) length, mass, volume, and temperature are measured using nonstandard units; f) inferences are made and conclusions are drawn about familiar objects and events; g) a question is developed from one or more observations; h) predictions are made based on patterns of observations; i) observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; and j) simple investigations and experiments are conducted to answer questions. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<p>observed and recorded, the objects or events can be arranged by those characteristics (e.g., several objects sorted by color, several events sorted on a timeline by age, etc.).</p> <ul style="list-style-type: none"> • Simple tools, such as a magnifying glass and a balance can extend the observations that people can make. • Nonstandard units such as paper clips, a student’s foot, index cards, etc., can be used to measure the length of objects. The mass of two objects can be compared by holding each object in a different hand. The volume of various liquids can be compared by pouring them in cups of the same size. Variations in temperature of different objects can be compared by the difference that is felt when each object is touched. Variations in air temperature can be compared by observing the differences one feels when in different environments (e.g., inside the classroom vs. outside on the playground in winter, inside the freezer compartment of a refrigerator vs. inside a kitchen). • An inference is a tentative explanation based on background knowledge and available data. • A conclusion is a summary statement based on data from the results of an investigation. • Questions about what is observed can be developed. 	

Standard 1.1

Strand: Scientific Investigation, Reasoning, and Logic

<p>1.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ul style="list-style-type: none"> a) the senses are used to observe differences in physical properties; b) observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy; c) objects or events are classified and arranged according to characteristics or properties; d) simple tools are used to enhance observations; e) length, mass, volume, and temperature are measured using nonstandard units; f) inferences are made and conclusions are drawn about familiar objects and events; g) a question is developed from one or more observations; h) predictions are made based on patterns of observations; i) observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; and j) simple investigations and experiments are conducted to answer questions. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<ul style="list-style-type: none"> • A prediction is a forecast about what may happen in some future situation. It is based on information and evidence. A prediction is different from a guess. • Graphs are powerful ways to display data, making it easier to recognize important information. Describing things as accurately as possible is important in science because it enables people to compare their observations with those of others. • Data should be displayed in bar graphs and picture graphs at the grade one level. • An experiment is a fair test designed to answer a question. 	

Grade One Science Strand

Force, Motion, and Energy

This strand focuses on student understanding of what force, motion, and energy are and how the concepts are connected. The major topics developed in this strand include magnetism, types of motion, simple and compound machines, and energy forms and transformations, especially electricity, sound, and light. This strand includes science standards K.3, 1.2, 2.2, 3.2, 4.2, 4.3, 5.2, 5.3, 6.2, and 6.3.

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| 1.2 | <p>The student will investigate and understand that moving objects exhibit different kinds of motion. Key concepts include</p> <ul style="list-style-type: none">a) objects may have straight, circular, and back-and-forth motions;b) objects may vibrate and produce sound; andc) pushes or pulls can change the movement of an object. |
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Overview

Physical science includes topics that give students a chance to increase their understanding of the characteristics of objects and materials that they encounter daily. Knowledge about objects develops through learning how they move and change position and shape in relation to the viewer, as when we look at objects from different angles. Students learn about objects by observing them and noting similarities and differences and by acting on them by applying force. This concept relates to science standard K.3, in which magnets push and pull objects. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (1.1) in the context of the key concepts presented in this standard.

Standard 1.2

Strand: Force, Motion, and Energy

1.2 The student will investigate and understand that moving objects exhibit different kinds of motion. Key concepts include a) objects may have straight, circular, and back-and-forth motions; b) objects may vibrate and produce sound; and c) pushes or pulls can change the movement of an object.	
Understanding the Standard (Background Information for Instructor Use Only)	Essential Knowledge, Skills, and Processes
<ul style="list-style-type: none">• An object's motion may be described by tracing and measuring its position over time. The motion of objects may be straight, circular, curved, or back-and-forth.• One kind of back-and-forth motion is vibration. Vibrations may create sound.• Pushing or pulling can change the position and motion of objects. For the same object, the size of the change is related to the strength of the push or pull.	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none">• make and communicate observations about moving objects. Examples should include balls, objects with wheels, windup toys, tops, rubber bands, and playground equipment.• predict an object's movement, using its size, shape, and the force of the push or pull on it.• manipulate objects in order to describe and classify the motion of each object as straight, circular, or back-and-forth.• understand that vibrations may create sound, such as humming, strumming a guitar, or plucking a rubber band.• record observations of movement (length/distance), using nonstandard units.

Grade One Science Strand

Matter

This strand focuses on the description, physical properties, and basic structure of matter. The major topics developed in this strand include concepts related to the basic description of objects, phases of matter (solids, liquids, and gases – especially water), phase changes, mass and volume, and the structure of classification of matter. This strand includes science standards K.4, K.5, 1.3, 2.3, 3.3, 5.4, 6.4, 6.5, and 6.6.

- 1.3 The student will investigate and understand how different common materials interact with water. Key concepts include
- a) some liquids will separate when mixed with water, but others will not;
 - b) some solids will dissolve in water, but others will not; and
 - c) some substances will dissolve more readily in hot water than in cold water.

Overview

Students continue their study of water by examining and qualitatively describing water and its behavior with other matter. When carefully observed, described, and measured, the properties of objects in or with water, and the changes that occur when materials interact with water, provide the necessary foundation for more abstract ideas in the upper grade levels. This concept is related to science standard K.5 in which students identify water in its different phases (solid, liquid, gas). It is intended that students will actively develop scientific investigation, reasoning, and logic skills (1.1) in the context of the key concepts presented in this standard.

Standard 1.3

Strand: Matter

<p>1.3 The student will investigate and understand how different common materials interact with water. Key concepts include</p> <ul style="list-style-type: none"> a) some liquids will separate when mixed with water, but others will not; b) some solids will dissolve in water, but others will not; and c) some substances will dissolve more readily in hot water than in cold water. 	
<p>Understanding the Standard (Background Information for Instructor Use Only)</p>	<p>Essential Knowledge, Skills, and Processes</p>
<ul style="list-style-type: none"> • Different types of materials act differently when mixed with water. • Some liquids will mix with water, while others will not. • Some solids will dissolve in water, while others will not. • The temperature of the water affects how easily a substance will dissolve in it. 	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> • describe and apply the term dissolve. • predict and describe how various materials (vinegar, milk, baking soda, powdered drink mix, sugar, salt, sand, oil, soil, rocks) act when mixed with water. • classify liquids and solids into those that will dissolve in water and those that will not. Use tables and/or charts to record and display the information. • infer that some substances will dissolve more easily in hot water than in cold water by conducting investigations using water at different temperatures.

Grade One Science Strand

Life Processes

This strand focuses on the life processes of plants and animals and the specific needs of each. The major topics developed in the strand include basic needs and life processes of organisms, their physical characteristics, orderly changes in life cycles, behavioral and physical adaptations, and survival and perpetuation of species. This strand includes science standards K.6, K.7, 1.4, 1.5, 2.4, 3.4, and 4.4.

- 1.4 The student will investigate and understand that plants have basic life needs and functional parts and can be classified according to certain characteristics. Key concepts include
- a) plants need nutrients, air, water, light, and a place to grow;
 - b) basic parts of plants; and
 - c) plants can be classified based on a variety of characteristics.

Overview

Young children have a natural curiosity about the living things that they encounter. Observation is a method by which students can answer questions about how plants live, their parts, and characteristics. All plants need nutrients, air, water, light, and a place with sufficient space to grow. They have specific structures to meet their needs. Students need to know the concepts, not the definitions, of the terms edible, nonedible, evergreen, and deciduous. They need to know that we eat certain plants (edible) but not others (nonedible). They need to know that some plants stay green all year long (evergreen) while others lose their leaves each fall (deciduous). The concepts in this standard build upon the Life Processes strand (K.6 and K.7), in which students investigate and understand basic needs and life processes of plants and animals. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (1.1) in the context of the key concepts presented in this standard.

<p>1.4 The student will investigate and understand that plants have basic life needs and functional parts and can be classified according to certain characteristics. Key concepts include</p> <ul style="list-style-type: none"> a) plants need nutrients, air, water, light, and a place to grow; b) basic parts of plants; and c) plants can be classified based on a variety of characteristics. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<ul style="list-style-type: none"> • Plants have basic needs, including nutrients, air, water, light, and a place with sufficient space to grow. • Plants have different structures that serve different functions in growth, survival, and reproduction. • The functions of plant parts include the roots which hold plants in place and absorb water, seeds which make new plants, leaves which make food for the plant, and stems which hold the plants upright and transport materials up and down the plant. • Plants can be categorized by their different characteristics, such as edible/nonedible, flowering/nonflowering, and evergreen/deciduous. Students do not need to know the terms nonedible, edible, evergreen, and deciduous. The focus should be on the concept, not the terminology. 	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> • conduct simple experiments/investigations related to plant needs by changing one variable (nutrients, air, water, light, or place to grow) at a time. Students do not need to know the term variable. • create and interpret a model/drawing of a plant, including seeds, roots, stems, leaves, flowers, and fruits. • identify the functions of the seed, root, stem, and leaf. • classify plants by the characteristics of edible/nonedible, flowering/nonflowering, and evergreen/deciduous, using charts.

- 1.5 The student will investigate and understand that animals, including humans, have basic needs and certain distinguishing characteristics. Key concepts include
- a) basic needs include adequate air, food, water, shelter, and space (habitat);
 - b) animals, including humans, have many different physical characteristics; and
 - c) animals can be classified according to a variety of characteristics.

Overview

This standard focuses on the idea that animals move, need food, breathe, and reproduce. Animals have a variety of ways in which they accomplish these activities. Each type of animal has features that allow it to function in unique and specific ways to obtain food, reproduce, and survive in a particular place. This standard builds upon the Life Processes strand (K.6 and K.7), in which students are introduced to the concept of living and nonliving, and investigate and understand basic needs and life processes of plants and animals. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (1.1) in the context of the key concepts presented in this standard.

<p>1.5 The student will investigate and understand that animals, including humans, have basic needs and certain distinguishing characteristics. Key concepts include</p> <ul style="list-style-type: none"> a) basic needs include adequate air, food, water, shelter, and space (habitat); b) animals, including humans, have many different physical characteristics; and c) animals can be classified according to a variety of characteristics. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<ul style="list-style-type: none"> • Animals, including people, have basic life needs, including air, food, water, shelter, and space (habitat). Students do not need to know the term habitat. The focus should be on the items that are necessary components of a habitat, not on the terminology. • Body coverings include hair, fur, feathers, scales, and shells. • Appendages are parts, such as arms, legs, wings, fins, and tails, which extend from the main body and have specific functions. Students do not need to know the term appendage. The focus should be on the concept, not the terminology. • Methods of movement may include walking, crawling, flying, and swimming. • Simple ways to classify animals are whether they are wild or domestic and whether they live on land or in water. 	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> • make and communicate observations of live animals, including humans, about their needs, physical characteristics, and where they live. • describe the life needs of animals, including air, food, water, shelter, and space. • identify and chart simple characteristics by which animals can be classified, including body coverings (hair, fur, feathers, scales, and shells), body shape, appendages (arms, legs, wings, fins, and tails), methods of movement (walking, crawling, flying, and swimming), wild or domestic, and water homes or land homes. • distinguish between wild animals (raccoon, hawk, squirrel, shark) and domestic animals (dog, cat, sheep) and recognize examples of each. • infer types of animal homes (water or land), using the physical characteristics of the animals, such as scales and fins that allow fish to live and move in water or fur and legs that allow dogs to live and move on land. • classify animals by where they live (their homes).

Grade One Science Strand

Interrelationships in Earth/Space Systems

This strand focuses on student understanding of relationships within and among Earth and space systems. The topics developed include shadows; relationships between the sun and Earth; weather types, patterns, and instruments; properties of soil; characteristics of the ocean environment; and organization of the solar system. This strand includes science standards K.8, 1.6, 2.6, 3.7, 4.6, 5.6, and 6.8.

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| 1.6 | The student will investigate and understand the basic relationships between the sun and Earth. Key concepts include
a) the sun is the source of energy and light that warms the land, air, and water; and
b) the sun's relative position in the morning is east and in the late afternoon is west. |
|-----|--|

Overview

This standard focuses on some of the important relationships between the sun and Earth. Students need to understand that the sun is a source of energy, and that energy provides light and warmth for Earth. This standard builds upon science standard K.8 about light and shadow. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (1.1) in the context of the key concepts presented in this standard.

Standard 1.6

Strand: Interrelationships in Earth/Space Systems

1.6 The student will investigate and understand the basic relationships between the sun and Earth. Key concepts include a) the sun is the source of energy and light that warms the land, air, and water; and b) the sun's relative position in the morning is east and in the late afternoon is west.	
Understanding the Standard (Background Information for Instructor Use Only)	Essential Knowledge, Skills, and Processes
<ul style="list-style-type: none">• The sun provides Earth with light (a form of radiant energy) and thermal energy.• By transferring thermal energy to Earth, Earth's atmosphere and land are heated. Thermal energy may be transferred from one substance to another by three means: conduction, convection, and radiation.• The sun provides energy, which warms the land, air, and water on Earth.• The sun's relative position in the morning is east and in the late afternoon is west.	In order to meet this standard, it is expected that students will <ul style="list-style-type: none">• infer that sunlight striking an object makes the object warmer.• conduct simple experiments to show how sunlight changes the temperature of land, air, and water.• interpret the relationship between the sun's position in the sky and the general time of day. This includes the sun's relative position in the morning (east), at noon, and in the late afternoon (west).

Grade One Science Strand

Earth Patterns, Cycles, and Change

This strand focuses on student understanding of patterns in nature, natural cycles, and changes that occur both quickly and slowly over time. An important idea represented in this strand is the relationship among Earth patterns, cycles, and change and their effects on living things. The topics developed include noting and measuring changes, weather and seasonal changes, the water cycle, cycles in the Earth-moon-sun system, our solar system, and change in Earth's surface over time. This strand includes science standards K.9, K.10 1.7, 2.7, 3.8, 3.9, 4.7, and 5.7.

- 1.7 The student will investigate and understand weather and seasonal changes. Key concepts include
- a) changes in temperature, light, and precipitation affect plants and animals, including humans;
 - b) there are relationships between daily and seasonal changes; and
 - c) changes in temperature, light, and precipitation can be observed and recorded over time.

Overview

The focus of this standard is on temperature, light, and precipitation as they relate to life changes in plants, animals, and people. There are many ways to acquaint children with Earth science-related phenomena that they will come to understand later as being cyclic, and this standard introduces those ideas. It is enough for young children to observe the pattern of daily changes without getting deeply into the nature of climate. They should notice how these changes affect plants and animals. This is observable and can be charted over short and intermediate time periods. Students need to understand the concepts of migration, hibernation, and habitat, but they do not necessarily need to know the terms at first grade. This standard builds upon science standard K.9 in which students investigate and understand simple patterns in their daily lives. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (1.1) in the context of the key concepts presented in this standard.

Standard 1.7

Strand: Earth Patterns, Cycles, and Change

<p>1.7 The student will investigate and understand weather and seasonal changes. Key concepts include</p> <ol style="list-style-type: none"> changes in temperature, light, and precipitation affect plants and animals, including humans; there are relationships between daily and seasonal changes; and changes in temperature, light, and precipitation can be observed and recorded over time. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<ul style="list-style-type: none"> • Seasonal changes bring about changes in plants, animals, and people. • With seasonal changes come changes in weather, including temperature, light, and precipitation. • Precipitation includes rain, snow, and ice. • Changes in plants include budding, growth, and losing leaves. • Some animals hibernate and some animals migrate as a result of seasonal changes, resulting in changes in habitat. Students do not need to know the terms migration, hibernation, and habitat. The focus should be on the concepts, not the terminology. • Hibernation is a state of greatly reduced metabolic activity and lowered body temperature adopted by certain mammals as an adaptation to adverse winter conditions. Most animals are not “true hibernators” but rely on a combination of reserve body fat, stored food supplies (in rodents only), and a protected den to enable it to survive the winter. At intervals of several weeks the animal elevates its body temperature, awakens, moves about, feeds, and then returns to its state of torpor. • Migration is the regular, usually seasonal, movement of all or part of an animal population to and from a given area. The distance traveled may be a few miles or several thousands of miles. Animals migrate for many different reasons. Some animals migrate to find better sources of food, water, or shelter. Other animals migrate to visit particular breeding grounds, rear their young, or find warmer climates. The frequency of animals’ migrations also differs. • An animal’s living place is called its habitat. Most animals are only adapted to live in one or two habitats. Earth has many different environments, varying in temperature, moisture, light, and many other 	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> • identify types of precipitation as rain, snow, and ice and the temperature conditions that result in each one. • relate a temperature, light, and precipitation chart to the corresponding season (daily or weekly). • observe and chart changes in plants, including budding, growth, and losing leaves. Recognize in what season budding and losing leaves will most likely occur. • predict how an outdoor plant would change through the seasons. • compare and contrast the four seasons of spring, summer, fall (autumn) and winter in terms of temperature, light, and precipitation. • compare and contrast the activities of some common animals (e.g., squirrels, chipmunks, butterflies, bees, ants, bats, frogs, and humans) during summer and winter by describing changes in their behaviors and body covering. • compare and contrast how some common plants (e.g., oak trees, pine trees, and lawn grass) appear during summer and winter. • comprehend at an introductory level that some animals respond to seasonal changes by hibernating (e.g., frogs, bats) or migrating (e.g., some birds and butterflies). (It may be useful to recognize common Virginia animals that hibernate and migrate, but the specific names of animals are not the focus of student learning here.) • infer what the season is from people’s dress, recreational activities, and work activities.

Standard 1.7

Strand: Earth Patterns, Cycles, and Change

1.7 The student will investigate and understand weather and seasonal changes. Key concepts include a) changes in temperature, light, and precipitation affect plants and animals, including humans; b) there are relationships between daily and seasonal changes; and c) changes in temperature, light, and precipitation can be observed and recorded over time.	
Understanding the Standard (Background Information for Instructor Use Only)	Essential Knowledge, Skills, and Processes
<p>factors. Each of these habitats has distinct life forms living in it, forming complex communities of interdependent organisms. A habitat must include a source of food for the animal, a source of water for the animal, access to some sort of shelter for the animal, and an adequate amount of space so that enough habitat components are available to the animal. Some animals' habitats are very small, but some animals require a large amount of space.</p> <ul style="list-style-type: none">• The body coverings of some animals change with the seasons. This includes thickness of fur and coloration.• Changes made by people include their dress, recreation, and work.	

Grade One Science Strand

Earth Resources

This strand focuses on student understanding of the role of resources in the natural world and how people can utilize those resources in a sustainable way. An important idea represented in this strand is the concept of management of resource use. This begins with basic ideas of conservation and proceeds to more abstract consideration of costs and benefits. The topics developed include conservation of materials, soil and plants as resources, energy use, water, Virginia's resources, and how public policy impacts the environment. This strand includes science standards K.11, 1.8, 2.8, 3.10, 3.11, 4.9, and 6.9.

- 1.8 The student will investigate and understand that natural resources are limited. Key concepts include
- a) identification of natural resources;
 - b) factors that affect air and water quality; and
 - c) recycling, reusing, and reducing consumption of natural resources.

Overview

This standard focuses on identifying what natural resources are; basic ways we can help conserve those natural resources, especially water and air; and the preservation of land to use as parks. The standard extends the perception of young students from the present to the future and from self to their community. Standard K.11 establishes a foundation for this standard. It is intended that students will actively develop scientific investigation, reasoning, and logic skills (1.1) in the context of the key concepts presented in this standard.

Standard 1.8

Strand: Earth Resources

<p>1.8 The student will investigate and understand that natural resources are limited. Key concepts include</p> <ul style="list-style-type: none"> a) identification of natural resources; b) factors that affect air and water quality; and c) recycling, reusing, and reducing consumption of natural resources. 	
<p style="text-align: center;">Understanding the Standard (Background Information for Instructor Use Only)</p>	<p style="text-align: center;">Essential Knowledge, Skills, and Processes</p>
<ul style="list-style-type: none"> • Natural resources provide us with the things we need in order to live, including food, clothing, water, air, shelter, land, and energy. • What we put into the air, especially the products of the fuels we burn, affects the quality of the air. Waste produced by animals, including humans, and factories can affect the quality of water. Some pollution washes from yards, streets, and farms. • Many natural resources are limited and cannot be renewed. Other resources are limited and cannot be renewed, but they may last a very long time. • Recycling recovers used materials. Many materials can be recycled and used again, sometimes in different forms. Recycling helps to save our natural resources. An example of a recycled material is newspapers that are turned into writing tablets. • Reusing materials means using them more than once. Examples include using dishes and utensils that are washed after use rather than using paper plates and plastic utensils and putting them in the trash. • Resources will last longer if we recycle them, reuse them, or reduce consumption of them. • The creation of parks can help preserve land. Parks have many uses, including recreation. 	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> • identify natural resources such as plants and animals, water, air, land, minerals, forests, and soil. • recognize that many natural resources are limited. • compare and contrast ways of conserving resources. This includes recycling, reusing, and reducing consumption of natural resources. • classify factors that affect air and water quality. • describe ways students and schools can help improve water and air quality in our communities. • determine some basic factors that affect water quality by conducting simple investigations in the school environment. Students should be able to make and record observations of what happens to runoff water on rainy days. (Related to 1.3.) • predict what would happen if natural resources were used up, and explain ways to prevent this from happening. • discuss the value of parks to wildlife and to people.